PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

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File 82770/001
22 SEP 2004
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NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Rule 71.1)

	Date of mailing *(day/month/year)* 20.09.2004
Applicant's or agent's file reference 3.35.82770/001	**IMPORTANT NOTIFICATION**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/FI 03/00501	19.06.2003	24.06.2002

Applicant
BOREALIS TECHNOLOGY OY

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:

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PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 3.35.82770/001	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/FI 03/00501	International filing date *(day/month/year)* 19.06.2003	Priority date *(day/month/year)* 24.06.2002
International Patent Classification (IPC) or both national classification and IPC C08L23/06		
Applicant BOREALIS TECHNOLOGY OY		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
09.01.2004	20.09.2004
Name and mailing address of the international preliminary examining authority: European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Schmidt, H Telephone No. +31 70 340-2461

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI 03/00501

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-18, 20, 21	as originally filed
19	received on 13.08.2004 with letter of 11.08.2004

Claims, Numbers

1-20	received on 13.08.2004 with letter of 11.08.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-20
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-20
Industrial applicability (IA)	Yes:	Claims	1-20
	No:	Claims	

2. Citations and explanations

see separate sheet

Box I

1. The following documents (D1-D2) are referred to in this opinion: the numbering will be adhered to in the rest of the procedure:

D1 US-A-6096014
D2 WO-A-9941310

Box VIII

2. The application does not meet the requirements of Article 6 PCT, because claims 1, 7, 14 and 15 are not clear.

2.1 Present claims 1, 7 and 14 specify ranges for the properties melt flow rate and density of polymer (ii). Polymer (iii) has a lower melt index and a density than polymer (ii). The terms "lower" and "higher" are unclear: a skilled man does not know, which difference between the values of (ii) and (iii) are necessary (i.e. a difference in density of 0.0001 g/cm^3 or 0.1 g/cm^3 etc.) to obtain the desired technical effects, if any, and solve the technical problem.

2.2 The MFR2, MFR21 and density values of the bimodal ethylene composition are unclear in claim 1 and 7. As long as the term "comprising" is used under (i), these values are not only depending on the properties of (ii) and (iii), but also on the other components of (i). There is hence no clear definition for the properties of (i) and (iii). A skilled man reproducing the invention does not know how to obtain these values and how to choose (i) and (iii)

2.4 The value of the water vapour transmission is dependant on parameters not indicated in the claim like thickness of the film and additional additives. The disclosure of the apparatus used for the measurement alone is not sufficient for clarifying claim 15

Box V

3. The present claims appear to be novel acc. Art. 33(2) PCT.

D1 discloses microporous breathable films of $CaCO_3$ and blends of ethylene polymers with different melt indexes and densities. None of the resins disclosed has a melt flow rate of 50-500 g/10 min

D2 discloses non-breathable films of blends comprising 40% polyethylene of density=.97 g/cm^3, MI 410 g/10 min. The final composition has a density of d=.930 g/cm^3 and MFR_{21}=20 g/10 min. These parameters correspond to the present (i-a) and (i-b). D2 does not disclose additives

4. The present application does not meet the requirements of Article 33(3) PCT, because the subject-matter of claims 1-20 does not involve an inventive step

3.1 Subject matter of claim 1 is a compositions of
(i) 20-50% bimodal polyethylene composition of
(ii) 37-48% low molecular weight of a melt flow rate of 50-500 g/10min and a density of .94-.975 g/cm^3
(iii) 52-63% a polyethylene of higher molecular weight (lower melt flow rate) and lower density
(iv) 40-70% particulate filler

Subject matter of claim 7 is a corresponding breathable film, subject matter of claim 14 a process of preparing such a film

3.2 Closest prior art is D1 disclosing a microporous breathable films of $CaCO_3$ and a blend of ethylene polymers with melt flow and density properties different from present claim 1.
The working examples of the present application are based on bimodal polymer composition (2)-(4), of which only (2)-(3) is according the invention (the MFR_2 of the entire bimodal polymer (4) is not determined). All the examples lead to breathable films (examples 5-10) using different compositional ranges of bimodal polymers. Since threre are no comparative examples, there is no evidence of advantageous technical effects. The problem to be solved by the present claims hence is to provide alternative compositions for breathable films with good mechanical properties, the corresponding breathable films and processes.
The use of bimodal compositions fullfilling the parameters of the present claims for films in general is known from D2, example 1. The choice of just another parameter range cannot be regarded as a solution giving rise to an inventive step. As long as there is no evidence for a technical effect generated by the use of the compositions of D2 in the breathable films of D1, the present claim only makes a choice out of equally likely alternatives. Such a choice is obvious and non-inventive.

D2 is disclosing compositions for films. These compositions have the same properties

as the bimodal compositions claimed in claim 1. A skilled man knows that breathability is a result of adding filler particles and subsequently stretching. All compositions suitable for films hence are also suitable for breathable films if the corresponding filler is added. A skilled man hence would consult D2 as well as all other documents relating to films if he wants to modify D1. In the present case, it is not the question in how many parameters D1 is differing from present claim 1, but whether the film foming polymer composition of D1 can be replaced by another - the one of D2. For a skilled man it is no question that both composition are useful for films and that both are suitable for breathable films, if a corresponding additive is added.

Table 1: Production data of Examples 2,3 and 3

Example	2	3	4
Ethylene concentration in loop reactor, mol-%	6.7	6.7	6.7
Hydrogen to ethylene ratio in loop reactor, mol/kmol	235	265	305
1-butene to ethylene mole ratio in loop reactor, mol/kmol	570	514	0
Polymer production rate in loop reactor, kg/h	25	26	25
MFR_2 of polymer produced in loop reactor, g/10 min	300	300	300
Density of polymer produced in loop reactor, kg/m^3	951	951	975
Ethylene concentration in gas phase reactor, mol-%	19	7.8	8.2
Hydrogen to ethylene ratio in gas phase reactor, mol/kmol	3	7	8
1-butene to ethylene mole ratio in gas phase reactor, mol/kmol	645	460	480
Average particle size of the powder, mm	0.38	0.36	ND
MFR_2 of the final polymer, g/10 min	0.47	0.21	ND
MFR_{21} of the final polymer, g/10 min	51	22	20
Density of the final polymer, kg/m^3	922	923	931
Split, loop/gpr	45/55	41/59	41/59

ND denotes that the respective property has not been determined

Example 6

The procedure of Example 5 was repeated, except that the polymer composition comprised of 40 % by weight of polymer produced in Example 2 as the bimodal polyethylene composition and 60 % by weight of $CaCO_3$. The composition was then blown to a film and the resulting film was stretched in the machine direction 6 times its original length. The resulting film had a thickness of 19 μm, a basis weight of 16 g/m^2, tensile strength in the machine direction of 59 MPa, and in the transverse direction of 4.1 MPa. Tear strength in

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Claims

1. A composition for making breathable films, the composition comprising:

(1) 20-50%, based on the weight of the total composition, a bimodal polyethylene composition, further comprising

(i-a) a first low molecular weight component, which is a homopolymer of ethylene or a copolymer of ethylene and one or more C_4 to C_{10} alpha-olefins, having a melt flow rate, determined according to ISO 1133 at 190°C, MFR_2 of 50 to 500 g/10 min, preferably of 100 to 400 g/10 min and a density of 940 to 975 kg/m^3, preferably 945 to 975 kg/m^3, the first component being present in the bimodal polyethylene composition in an amount of 37 to 48% by weight,

(i-b) at least a second component, which is a copolymer of ethylene and one or more C_4 to C_{10} alpha-olefins, having a higher molecular weight, a lower melt flow rate and a lower density than the said first component, the second component being present in the bimodal polyethylene composition in an amount of 52 to 63% by weight, so that the said bimodal polyethylene composition has a melt flow rate, determined according to ISO 1133 at 190°C, MFR_2 in the range of 0.1 to 4.0 g/10 min, MFR_{21} in the range of 15 to 200 g/10 min, and a density of 918 to 935 kg/m^3,

(ii) 40-70%, based on the weight of the total composition, a particulate filler, and

(iii) 0-30%, based on the weight of the total composition, another olefin-based polymer.

2. The composition according to Claim 1, wherein the other olefin based polymer is selected from the group of homo- and copolymers propylene, 1-butene and 4-methyl-1-pentene.

3. The composition according to Claim 1 or 2, wherein the other olefin based polymer is a propylene homo- or copolymer, preferably a copolymer of propylene and ethylene.

4. The composition according to Claim 3, wherein the composition comprises of 5 to 20%, based on the weight of the total composition, of the said propylene polymer.

5. The composition according to Claim 1, wherein the content of the particulate filler is 55 to 70%.

6. A composition according to any one of the preceding claims, wherein the particulate filler is calcium carbonate.

7. The composition according to claim 1 wherein said bimodal polyethylene composition has the following properties (a) to (d):

(a) density from 918 to 935 kg/m^3

(b) melt flow rate MFR_2 from 0.1 to 0.8 g/10 min;

(c) melt flow rate, determined according to ISO 1133 at 190°C, MFR_{21} from 15 to 70 g/10 min;

(d) flow rate ratio MFR_{21}/MFR_2 from 60 to 120.

8. The composition according to Claim 7, wherein the bimodal polyethylene composition has:

(e) a weight average molecular weight (Mw) from 150000 to 300000 g/mol;

(f) a ratio of the weight average molecular weight to the number average molecular weight (M_w/M_n) from 7 to 30; and

(g) a content of alpha-olefin comonomer units of 2 to 5% by mole.

9. The composition according to any one of Claims 7 or 8, wherein the other olefin based polymer is a propylene homo- or copolymer, preferably a copolymer of propylene and ethylene.

10. The composition according to Claim 9, wherein the composition comprises of 5 to 20%, based on the weight of the total composition, of the said propylene

polymer.

11. The composition according to any one of Claims 7 or 8, wherein the content of the particulate filler is 55 to 70%.

12. A composition according to any one of Claims 7 to 11, wherein the particulate filler is calcium carbonate.

13. The use of the composition according to any one of Claims 1 to 12 for making films.

14. A breathable polymer film, which film comprises a composition according to any one of Claims 1 to 12.

15. A film according to Claim 14 wherein the film has a water vapour transmission rate, measured using a Permatran W100K water vapour permeation analysis system, of more than 3000 $g/m^2/24$ h, preferably more than 4000 $g/m^2/24$ h.

16. A film according to any one of Claims 14 to 15, wherein the film has a basis weight of less than 25 g/m^2.

17. A process for producing a breathable polymer film, comprising the steps of:

(A) providing into an extruder a composition according to any one of Claims 1 to 12

(B) extruding the composition to a film

(C) stretching the film to produce a breathable film.

18. The process according to Claim 17, wherein the film is stretched with a stretching ratio of 3 to 10, preferably 4 to 7.

19. The process according to any one of Claims 17 to 18, wherein the bimodal polyethylene composition has been produced by a process comprising the steps of:

(i) subjecting ethylene, hydrogen and optionally comonomers to a first polymerisation or copolymerisation reaction in the presence of the polymerisation catalyst in a first reaction zone or reactor to produce a first polymerisation product having a low molecular weight with a melt flow rate, determined according to ISO 1133 at 190°C, MFR_2 of 50 to 500 g/10 min, preferably of 100 to 400 g/10 min and a density of 940 to 975 kg/m^3, preferably 945 to 975 kg/m^3,

(ii) recovering the first polymerisation product from the first reaction zone,

(iii) feeding the first polymensation product into a second reaction zone or reactor,

(iv) feeding additional ethylene, comonomers and optionally hydrogen to the second reaction zone,

(v) subjecting additional ethylene and additional comonomer(s) and optionally hydrogen to the second reaction zone in the presence of the said polymerisation catalyst and the first polymerisation product,

(vi) to produce a polymer composition comprising from 41 to 48% by weight of the low molecular weight polymer produced in step (i), and from 59 to 52% by weight of the high molecular weight component produced in step (v),

(vii) the composition having a melt flow rate, determined according to ISO 1133 at 190°C, in the range MFR_2 of 0.1 to 4.0 g/10 min, preferably 0.1 to 0.8 g/10 min and a density of 918 to 935 kg/m^3, and

(viii) recovering the combined polymerisation product from the second reaction zone.

20. The process according to Claim 19, wherein at least part of the volatile components of the reaction medium are evaporated and removed from the first polymerisation product before the said first polymerisation product is introduced into the second reaction zone or reactor.